

waveform roughing

Maximum Material Removal

Waveform roughing strategy is a high speed machining technique that maintains a constant tool cutting load by ensuring the tool engagement into the material is consistent. The tool path moves in a smooth path to avoid sharp changes in direction which maintains the machine tool's velocity.

Benefits include :
Reduces cycle time

Tool life maximised

Full flute of tool utilised

Minimum tool vibration

Constant chip load

Intelligent toolpath linking

Cuts deeper and faster

Constant Engagement

Although the Concentric pattern looks much simpler at the first glance the problem is that the tool "digs" into each corner causing the tool to overload, leading to reduced tool life or tool breakage. In reality the machine tool operator may have to reduce the cycle feed rate to compensate and thus, increase manufacturing time.

As Waveform maintains a constant engagement with the material, the feed rate can remain at the optimal value throughout the cycle. This will improve the tool life and greatly reduce the risk of tool breakage - it is very simple to switch from traditional roughing to Waveform to see the toolpath pattern.

The Waveform Pattern

To maintain a constant chip load the cycle uses the philosophy that we machine from "Stock to part". This reduces the amount of intermittent cuts, particularly on external regions, which means the tool is engaged with the material for longer without lifting clear. Traditionally, cycles generally offset the component until they meet the stock. This can lead to the generation of sharp corners and discontinuous tool paths.

For pocket regions the tool will helical in to depth at the centre and open the pocket up so that it can create a continuous spiral cut until the edge of the pocket is reached. Any remaining corners are then removed. Waveform automatically detects open areas and uses them for tool entry, rather than cutting an open region like a closed region.

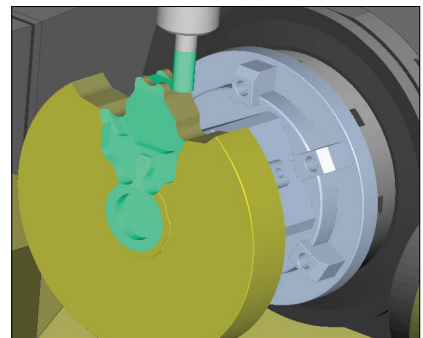
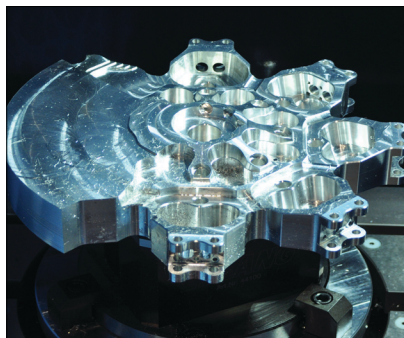
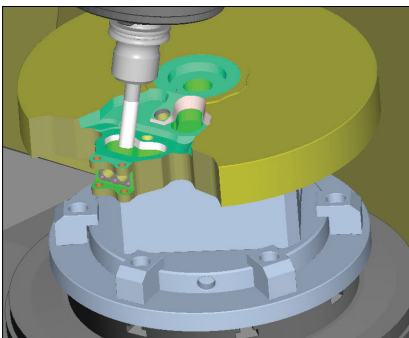
Adjusted Tool Engagement

To maintain the tool engagement and the chip load the tool path is automatically adjusted to compensate. When cutting into a concave area tool engagement is increased. The cycle adjusts the step over between the passes to compensate and maintain the desired engagement.

When cutting a convex area the opposite affect occurs. As the material falls away the tool path step over is increased to maintain the desired engagement.

Intelligent Linking

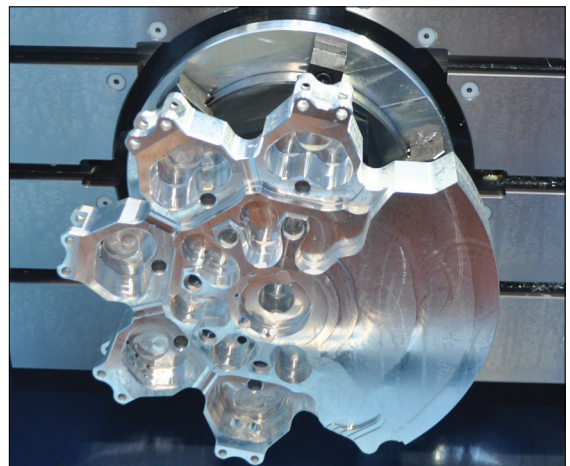
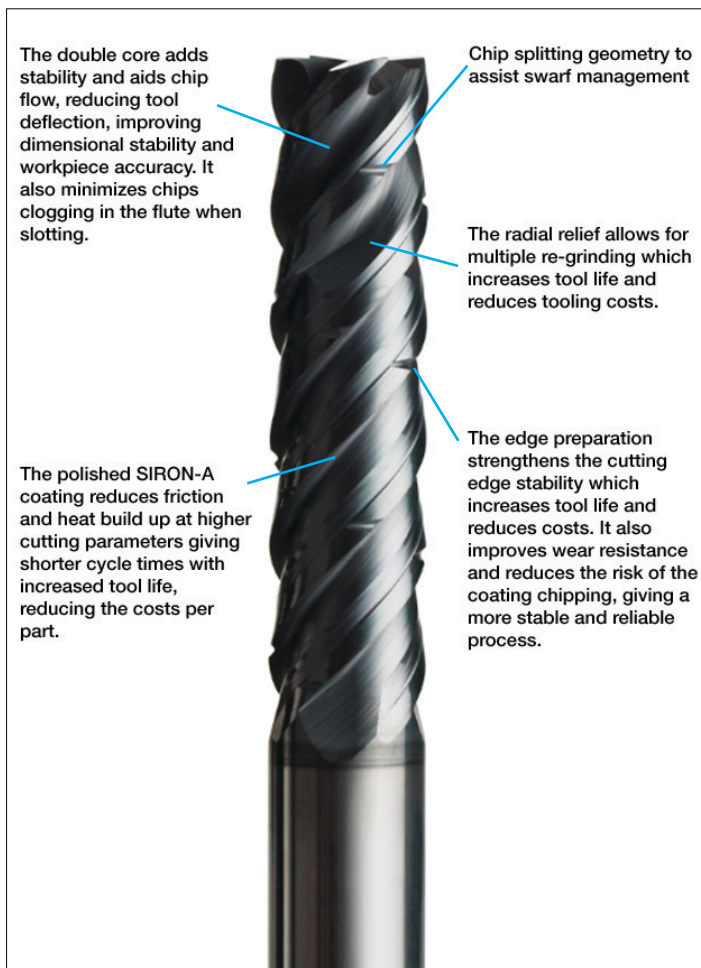
To improve cycle efficiency, Waveform provides the ability to stay at depth whilst moving between milling areas or go up and over and stepping off the component.



waveform

Waveform Roughing greatly improves standard roughing cycles by removing a constant volume of material.

Cutting along as much of the flute length as possible distributes wear evenly along the entire flute length, rather than just the tip, massively reducing tool vibration. The radial cut depth is also reduced to ensure a consistent cutting force, allowing cut material to escape from the flutes. Tool life is further extended as most of the heat is removed in the chip.



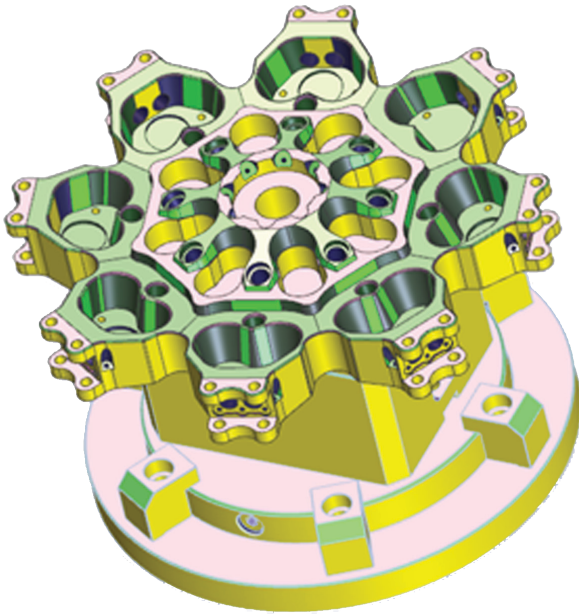
edgecam


Matsuura

SECO 

Demonstration developed at Matsuura UK Productivity Centre with Edgecam Business Partners, Matsuura & Seco Tools.

The MX-520 is one of Matsuura's best selling 5 Axis machine tools and at the Southern Manufacturing Exhibition will be showcasing the machines capability enhanced with Edgecam generated toolpaths & Seco tooling.



MX-520 – Edgecam Programming Features

Waveform Roughing - High Speed Roughing Strategy that maintains constant tool cutting load & engagement.

5-Axis Multiplane & Simultaneous Cycles - 5-Axis Positional and simultaneous toolpaths demonstrating SWARF capabilities. In addition Edgecam also provides methods for collision avoidance. The tool & Holder are “checked” for any possible collision with the necessary tilts being applied.

Chamfer Cycle – Automatically deburring sharp edges and forming modelled chamfers the cycle removes the requirement to prepare geometry on the part and also increases quality of the finished component.

Simulation - Full machine simulation provides complete visualisation of both the tool on the part and kinematic movements of all axis ensuring collision free toolpaths that are within the limits of the machine tool. Proveout at the machine is dramatically reduced therefore increasing productivity.

Operation	Waveform Roughing
Tool Details	16mm Seco JS554160D3C.0 Z4C Sir A
Speed	10,000 RPM
Feed	5,000 mm/min
Ap	55mm
Ae	2mm (13%)
Entry Strategy	Side
MRR	550 cm ³

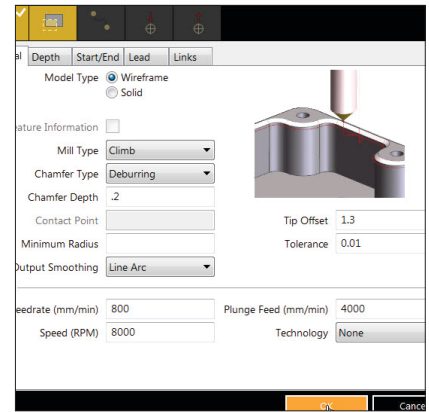


Additional Edgecam Technology Used :

5-Axis Simultaneous Machining

This method of machining employs both Straight & Tapered Endmills where previously this would have been not possible to create without the assistance of CAM.

The technique saves time whilst utilising flank or swarf machining where previously “water-line” strategies would have been employed.



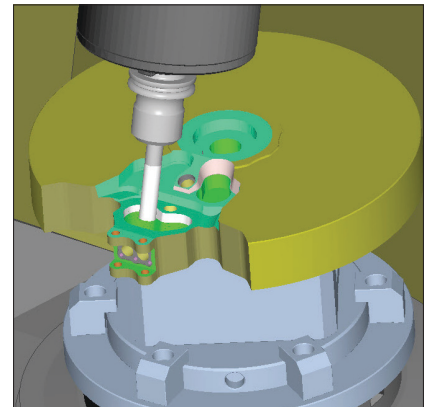
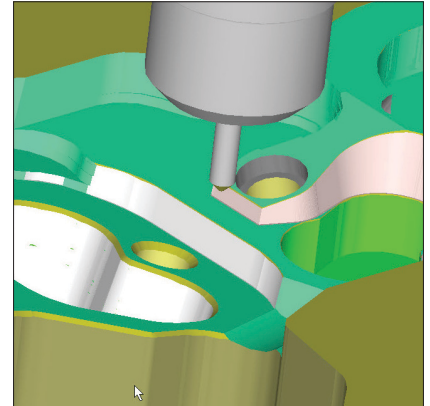
Postprocessor

Edgecam Postprocessor graphics reflect the kinematic structure of the machine tool giving the benefit of both the Linear & Rotary Axis being checked.

This enables the Programmer to feel confident prior to running on the machine tool.

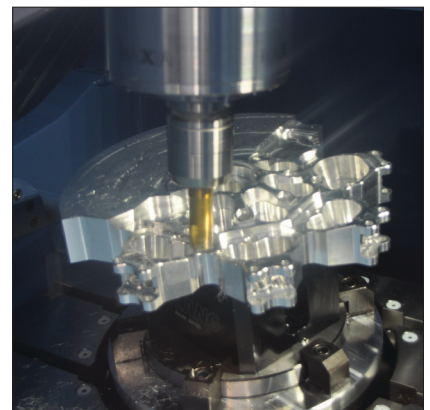
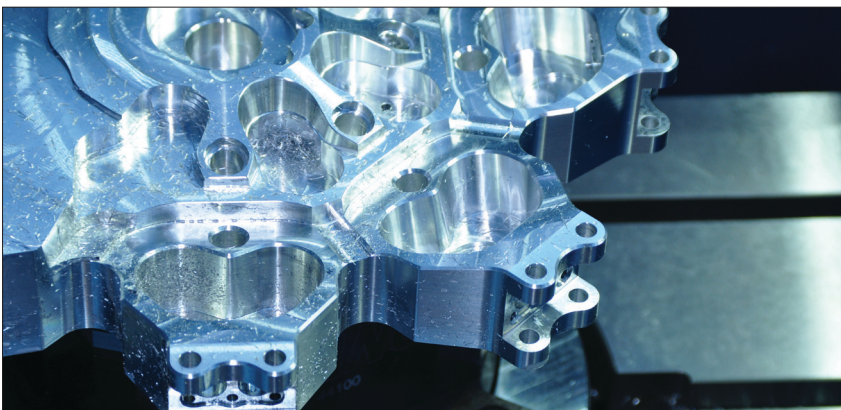
If the machine table is requested by the programme to move to an angle beyond its limit – Edgecam will warn the user and automatically provide an alternative solution.

This ensures that there is less machine downtime proving out programmes on the machine creating a more efficient process Datum handling on XY&Z Axis is automatically aligned allowing the User to focus on the task of programming



Chamfering Cycle

Introduced at 2014R1. Handles solid features and wireframe entities. Break Corners and leave no burrs. Time saving over hand deburring and can be used on 2D and 3D shapes.



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